ADDRESS

OF

HON. GEO. B. LORING,

COMMISSIONER OF AGRICULTURE,

AND

OTHER PROCEEDINGS

OF THE

COTTON CONVENTION

HELD IN ATLANTA, GA., NOVEMBER 2, 1881.

WASHINGTON:
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PROCEEDINGS AND ADDRESS.

A convention of cotton-planters met in Atlanta, Ga., on the 2d of November, 1881, in accordance with the following circular, which was addressed to the secretary of each of the agricultural societies of the cotton States:

DEPARTMENT OF AGRICULTURE,
Washington, D. C., October 8, 1881.

DEAR SIR: It is proposed to hold at Atlanta, Ga., on Wednesday, November 2, a convention of cotton-growers. Your society is respectfully requested to send delegates to the same.

Very respectfully,

GEO. B. LORING,
Commissioner.

In response to this circular the convention assembled in Judges' Hall, at the Exposition Grounds, Atlanta, Ga., and at 12.20 p. m. was called to order by Director-General Kimball in the following remarks:

LADIES AND GENTLEMEN: This is a day and occasion to which I have long looked forward as one of exceeding interest and importance in connection with this Exposition. The National Cotton Planters' Association—an organization having its headquarters in Mississippi—at their last meeting held in Memphis adjourned to meet here at this time. They number some 600, and it was their purpose to come here in a body and to invite the co-operation of planters and parties interested in agriculture in the South to meet them here on this occasion. Dr. Loring, the Commissioner of Agriculture of the United States, united with them in this matter, and issued a call to the several organizations of agriculture throughout this section, advising them of this meeting. He kindly consented to come here in his official capacity, regarding this Exposition, its purposes and objects, in connection with agriculture, as of sufficient importance to demand the recognition of the department at Washington. He has sent here experts, in charge of certain experimental machinery, the purposes of which will be explained, and which, I doubt not, will be of great interest to every cotton-planter and every person interested in these matters.

Unfortunately, owing to the drought and lateness of the season, the Cotton Planters' Association, at a very late moment, decided that it would not be expedient for them to meet here until the 6th of December. I promptly notified Dr. Loring of this fact as soon as I was made aware of

it, and he informed me in reply that his arrangements were so far completed that it would be impossible to adjourn this meeting; and he is present with us to-day. His reports and his statements will, I understand, be made a part of his official report.

The Hon. Ashbel Smith, of Texas, will preside, and it only remains for me to announce this meeting for the purposes I have referred to.

Mr. ASHBEL SMITH:

Mr. DIRECTOR-GENERAL, LADIES, AND GENTLEMEN: I thank you sincerely for the honor of being selected to preside at this time over this meeting—a meeting of the thoughtful gentlemen of the Southern country; men whose thoughts govern the actions of men. The objects of our meeting to-day have been so clearly and handsomely stated by the director-general, I shall not detain you with one word further on that subject.

You will be so much better entertained, so much more instructed by the Commissioner of Agriculture, who will immediately address you, than by anything that I can say; and as I know, too, that you have not come here for words, but for thoughts, I shall no longer occupy your time, but beg respectfully to present to you Dr. Loring, the United States Commissioner of Agriculture. (Applause.)

COMMISSIONER LORING'S ADDRESS.

GENTLEMEN: The national importance of this Exposition, which has been collected and arranged with so much energy and skill, cannot be overestimated. Organized as it is in one of the great producing sections of our country and receiving its name from one of the most important and valuable of all our commercial staples, it has naturally drawn together a collection of products in which almost every industry is represented, and in which the ingenuity of the American people is admirably illustrated. It furnishes, moreover, an opportunity for the discussion of those practical questions upon a wise solution of which our prosperity and success depend. Standing here and surveying this vast accumulation of industrial wealth, our minds turn naturally to those practical investigations which develop, and to those economic problems which guide and influence, the industrial work which lies at the foundation of our civil power and our social comfort and refinement. It is in a convention of intelligent cultivators, and great inventors, and sagacious organizers that the policy best adapted to encourage and strengthen the hand of toil may properly be discussed, and it is in such a convention that the lessons taught by experience may most easily be learned. The wisdom, therefore, which designed, the patience which developed, the skill which arranged this impressive school of industry, have secured for it a place among the great efforts of our day to rouse and

encourage man by an imposing display of the fruits of his labor. Believing as I do in the vast importance of industrial associations of every kind, I count myself fortunate in having an opportunity to take part in this organized endeavor to exhibit what has been done to develop the industry of this section of our country, and to discover, if possible, what may still be done to promote its progress in material prosperity, and in mental and moral advancement. In the arrangement of that brilliant industrial display which marked the close of the first century of our national existence, and in which America won the admiration of the civilized world, I had the honor to perform an official service which I now recall with peculiar satisfaction. Not many months ago I took part in the opening exercises of an industrial exposition in my native State, in which the achievements of manufacturers and mechanics surpassed anything which words can describe. And I now congratulate myself that I can join in one more gratifying and significant illustration of the growth of American industry, and of the wisdom of that policy which has encouraged and protected it.

Before entering upon a discussion of the special industry which has called us together, I am sure you will allow me to remind you of the growth of our country in products of every description as a powerful argument and a useful lesson for this hour, and to call your attention to that wonderful development of which the cotton industry of the south forms a conspicuous part. In agriculture, the increase has been astonishing, and accounts for that vast internal and foreign commerce out of which has grown so much of our financial success. It is not necessary to go back a half century, or even twenty-five years, to obtain the most gratifying evidence of our progress in the work of tilling the soil. But starting in 1870, at which time we had reached an enormous production in proportion to our population, and making our comparisons with the returns of 1880, we may learn what can be accomplished in a single decade by a people constantly increasing in numbers and occupying new lands. In 1870 the amount of cotton produced was 4,352,317 bales; in 1880, more than 6,000,000 bales. In 1870 the amount of Indian corn raised was 760,944,549 bushels; in 1880, 1,754,449,435 bushels. In 1870 the wheat crop was 287,745,626 bushels; in 1880 it was 458,667,043 bushels. In 1870 the crop of oats reached 282,107,157 bushels; in 1880, 407,859,033 bushels. In 1870 the tobacco crop amounted to 262,735,341 pounds; in 1880 it amounted to 473,107,573 pounds. The increase of agricultural products was nearly one hundred per cent. in these ten years. And in the last year of this decade, from 1879 to 1880, out of this vast increase of our crops and products, our cattle export rose from $13,000,000 to $14,000,000; corn, from $43,000,000 to $50,000,000; wheat from $167,698,000 to $190,546,000; flour from $35,000,000 to $45,000,000; cotton from $209,852,000 to $245,534,391; beef from $7,009,000 to $12,000,000, lard from $28,000,000 to $35,000,000; and pork from $5,000,000 to $8,000,000.

Mark also the growth of American manufactures in half a century. In 1830 the amount invested in cotton manufactures was a little more than $40,000,000. The number of spindles was a million and a quarter. The number of males employed was 18,539, and the number of females was 38,927. The amount of cotton used was 77,759,316 pounds. Fifty years have passed away, and the number of spindles has increased to 10,769,147. The amount of cotton used in 1880 was 793,240,500 pounds. The number of persons employed is 181,628, and the amount of capital invested is more than $225,000,000 in mills and subsidiary work. Of our woolen manufactures the statistics are more imperfect. But I have ascertained that in 1840 the capital invested in this enterprise was $15,765,124; the number of pounds of wool used was 50,808,524; the number of hands employed was 21,342, and the value of the product was $20,696,699. In 1880 the value of woolens, worsted, carpets, and hosiery produced was $234,587,671; the amount of wool used was 187,616,605 pounds; the wages paid amounted to $45,959,012; the total value of the materials used was $145,141,798. The product increased from 1870 to 1880 nearly $20,000,000.

In 1870 the silk productions of the United States were valued at $12,210,662; in 1880 at $34,410,463.

Fifty years ago the shoe and leather industry had hardly a national reputation. In 1870, however, there were 4,237 tanneries in the United States, employing 20,784 hands, using a capital of $42,710,505, paying in wages $7,934,416 annually, producing leather valued at $86,169,383, using more than $9,000,000 worth of bark, nearly 9,000,000 hides, and 9,664,000 skins. There were also 3,085 currying establishments, employing 10,000 hands, absorbing $12,000,000 capital, and producing $54,191,167. There were, moreover, 3,151 establishments for the manufacture of boots and shoes, employing 91,702 hands, with a capital of $37,519,019, paying in wages $42,504,444 annually, using $80,502,718 worth of leather, manufacturing boots valued at $50,231,470, and shoes valued at $93,846,203, with a production valued at $146,704,000.

The growth of the iron and steel industry has been equally remarkable. In 1810 we produced but 50,000 tons of iron, and our largest furnace could yield but 1,500 tons annually. In 1830 the product was 165,000 tons; 1840, 315,000 tons; in 1848, 800,000; in 1860, 1,000,000 tons. In 1880 the iron and steel works of the United States produced 7,265,100 tons, as against 3,655,215 in 1870. The capital invested was $230,971,884; the number of hands employed was 140,978; the wages paid amounted to $55,476,785; and the value of all the products was $296,557,685.

In the manufacture of machinery the capital invested has increased from $15,000,000 to $40,000,000 in twenty years, and the annual value of the product is more than $20,000,000.

The aggregate annual product of the manufacturing and mechanical industries of the United States is now more than six thousand millions of dollars. Of this vast product less than two hundred millions are

exported. And of the $9,000,000,000 produced by agriculture less than 10 per cent. is exported. On the self-supporting power of the American people, and of the mutual relations existing between our industries it is, in view of these figures, unnecessary to enlarge.

Conspicuous among these products to which I have alluded stands the cotton crop, which, although not the largest of our agricultural products, stands in such a relation to our commerce and manufactures that it exerts a great influence upon our prosperity and progress. Occupying a large area in ten of the most truly agricultural States in the Union, it supplies a large agricultural population with the means of subsistence, and connects them immediately with the traffic of the outer world. And while it is not the largest crop in those States, and does not occupy the largest area of land, it forms the nucleus around which the other productive industries gather, and forms the basis of the transportation and trade of the section adapted to its growth. Under careless cultivation and adverse circumstances it enables an agricultural population to pursue their industry; and properly conducted in favorable seasons and on well-selected and well cultivated soil, it is undoubtedly the foundation of most reliable and profitable farming.

In discussing the value of this crop and its relations to the agriculture of the South, having already pointed out its value in connection with the manufactures of the country, I think it is important to understand the area of the cotton States and the acreage devoted to agricultural purposes.

	Superficial area.	Farm area.
	Acres.	*Acres.*
North Carolina	32,450,560	19,835,410
South Carolina	21,750,000	12,105,280
Georgia	87,120,000	23,647,941
Florida	37,931,520	2,373,541
Alabama	32,462,080	14,961,178
Mississippi	30,179,849	13,121,113
Louisiana	26,461,440	7,025,817
Texas	175,587,840	18,396,523
Arkansas	33,406,720	7,597,296
Tennessee	29,184,000	19,581,214

Of these acres devoted to farming purposes, there were improved, according to the census of 1880, in—

	Acres.
North Carolina	6,527,654
South Carolina	4,173,354
Georgia	8,207,726
Florida	947,640
Alabama	6,375,706
Mississippi	5,220,173
Texas	12,669,043
Arkansas	3,595,603
Tennessee	8,498,222

It will be seen that while the superficial area of these States is 456,000,000 acres, the tilled area is scarcely one-tenth of the whole surface.

Of this area, 14,347,608 acres are devoted to cotton; 17,548,814 to corn, 2,845,675 to oats, 3,377,798 to wheat, 141,513 to rye, 147,936 to barley, the product of which in 1880 was, of cotton, 5,688,184 bales; corn, 238,435,375 bushels; oats, 29,634,898 bushels; wheat, 20,442,668 bushels; rye, 655,670 bushels; barley, 635,308 bushels.

The relation which cotton culture bears to other crops in these States having been ascertained, it may be interesting to know the yield per acre, in order to understand the money value of the crop to the farmer. It has been found that the land in North Carolina yields one bale to 2.87 acres; South Carolina, a bale to 3.21 acres; Georgia, a bale to 3.54 acres; Florida, a bale to 3.86 acres; Alabama, a bale to 3.92 acres; Mississippi, a bale to 2.92 acres; Louisiana, a bale to 2.19 acres; Texas, a bale to 2.89 acres; Arkansas, a bale to 2.84 acres; Tennessee, a bale to 3.27 acres.

It is easy from these figures to estimate the money value per acre of this crop; and it is also easy to understand its vast importance as the source from which the cultivator can draw the ready money which he requires in the transaction of his business. And it should be borne in mind that in my estimates I have given the cereal and cotton crops (the most important productions there) of ten large States and more than 12,000,000 of people.

Now, I have no desire to discuss the fluctuations which have attended this branch of agriculture during the last fifteen years, nor the changes which have taken place in the division and management of the lands devoted to this crop. It could not be expected that out of widespread disaster, and with an entirely new social organization, there should spring a constant and uniform prosperity, or that without experience the laws regulating industry and business should be thoroughly understood. That ill-regulated labor and markets returning from a period of inflation to their normal condition should have broken up the plantation methods, is not surprising. Nor is it surprising that a system of small farms should not have been entirely successful in the hands of those unused to the economy and management of small landed estates; in fact, many of whom were entirely ignorant of the management of any estates whatsoever. But that the system of land-holding and farm management, which succeeds in other great agricultural sections of our country, may and will succeed at the South, there can be no doubt. True, the necessity for one mode of land management here and another there, for a time, must be apparent to every careful observer. That tenant management and proprietor management must go hand in hand for the present is obvious. But we must be aware that long continued, profitable farming has attended those alone who have given personal attention to their lands, and whose industry and skill have been stimulated by the cheering influence of actual possession—a stimulus which every American must feel who, be he tenant or landlord, enjoys a citizenship which removes him entirely from the condition of either the tenantry or the peasantry of the Old

World. The division of large estates into small tenant farms, subject to a well-defined system of cultivation, is of great advantage to the tenant and owner alike in the present condition of a portion of even the well-disposed and industrious population of the cotton States. But I cannot forget the tendency to independent ownership throughout our country, and the widely-diffused prosperity which is found in those sections where the farmer gathers his own crop from his own soil and seeks his own market. And I suggest this because I am inclined to believe that in this way can the two important points in the agriculture of the cotton States be most rapidly and permanently reached, namely: 1. The increase of the crop of cotton to the acre; and, 2, the introduction of diversified farming as a source of profit to the farmer and of benefit to the soil he cultivates.

Of course, I cannot speak from experience, but I see no reason why the cotton crop should not be carefully and systematically cultivated under that exact system which is applied to special crops, or why cotton cultivation should not be conducted with as much accuracy as is the cultivation of land devoted to local crops for local markets. There is a period in the occupancy of land for farming purposes when the farmer can, as it were, gather in the productions of the earth. The cereal crops of the newer States and the Territories are produced without special care and without the aid of fertilizers. The virgin soil pours forth its returns with unbounded liberality. But this condition does not long continue; and the husbandman is soon called on to manipulate his soil, and to restore its exhausted strength by careful farming and judicious fertilizing. In this lies the skill of the farmer, and in this lies also the reliable profit of his occupation. The agriculture of all the older countries of the world consists wholly of this, and has become an art by which man draws his subsistence from the soil, whether it be the wheat of England or the Black Sea, or the root crops of central Europe, or the wine and olives of the south, or the coffee of Arabia, or the tea of China and Japan. To all these crops the highest agricultural skill is applied whenever and wherever a bountiful and profitable crop is sought for. These results of farming are no more left to chance than are the charming shades and fascinating figures woven by the looms of Lowell and Lyons. And this is true of all our older States. Whenever a satisfactory crop of corn, or wheat, or hay is raised in these States, it is the result of great skill; and, if profitable, it is the result of the strictest economy. To those lands, lying around our large cities, which are devoted to market-gardening, and which produce enormous crops, the cultivator applies unceasingly his utmost ingenuity—and he seldom fails to reap an ample reward. It seems as if the earth was always ready with a liberal response to a wise and earnest appeal. And you must all have witnessed with admiration the success which has attended careful devotion to any crop, even when that crop was apparently insignificant. I suppose, nay, I think I have a right to be confident, that the same processes

applied to the cotton crop will meet with similar results. The yields of cotton on the 14,347,000 acres devoted to this crop varies from one bale to the acre to one bale to three and three-quarter acres. We are told that "The wonderfully productive alluvion of the Red and Ouachita rivers, and the never-failing richness of the Arkansas bottoms, give to the present area cultivated in Louisiana and Arkansas a high rate of yield: and the selected virgin soils of Texas are of equal productiveness. South Carolina and Georgia have more of a partially exhausted soil, of lower natural fertility, which without fertilization and good culture would not average a fourth of a bale to the acre. Under present management they average nearly a third of a bale. The North Carolina returns of yields for the past ten years have been quite uniformly higher than those of the other Atlantic States." A correspondent from Beaufort says: "One-half of all the land planted averages three-fourths of a bale." And a very distinguished gentleman from South Carolina, who receives for the rent of his land sixty pounds of lint cotton to the acre, informs me that his crop is usually as high as one bale. Now, allowing all that should be allowed for differences in soil and climate, these discrepancies in the cotton yield are greater than they should be, especially when we consider the vast value and importance of the crop, which entitles it to the best care and cultivation.

That the large area devoted to cotton could be at once improved by tillage and fertilizing cannot of course be expected. But much might be done in this direction with a large portion of it, even without reducing the area itself. The opportunities for fertilizing are much greater than is generally supposed, and under ordinary circumstances the farmer need not despair to whom an outlay of four or five dollars an acre for fertilizers is a cause of anxiety. Pulverized bones, even in small quantities, disintegrated mechanically; ashes of every description; marl, wherever it can be found; vegetable deposits in meadows and along the streams; the decayed leaves of the forest, cotton-seed meal and refuse from oil mills, and even the commingling of soils from different parts of the farm by hauling heavy soil upon the light, and light soft upon the heavy, all afford abundant means by which the ingenious and diligent farmer can improve the quality of his land without incurring the expense and exposing himself to the uncertainty of commercial fertilizers. Do you say the fields are too large for such work as this? Then occupy such space as you can manage with your careful culture, and you will find that the work can be extended gradually and economically, until the improvement covers the whole acreage—a process which will go on with surprising rapidity when once commenced. Add to all this the supply of manure which may be made by the diversified farming to which I shall hereafter allude, and the work will be far less discouraging than it appears to the inexperienced. Says a correspondent of the United States Agricultural Department, writing from Geneva, Ala.: "In 1870, planted 20 acres cotton in pine land, without fertilizing, and made 3 bales; in

1876 planted 3 acres and applied the manure of two cows, mare and colt for three months, and made 2,970 pounds seed cotton." I need no better illustration of the view I have advanced than this simple statement of an enterprising cotton-grower backed by two cows and a mare and colt. I know many an agricultural section, the value of whose product has been increased in proportion as the cultivated area has been reduced. This has already been the experience of many of the best planters in the cotton States. Says Mr. A. M. Aiken, in a report made to the Agricultural Department in February, 1881: "While such a large proportion in all the States adopt the careless plan, credit is due to the one-tenth of cotton-planters who have improved their seed, are using improved agricultural implements, and deem it very essential that a better and more careful system of culture be adopted, having proven to their satisfaction that this latter course is the only remunerative and economical one with free labor." And he adds: "I am satisfied that thorough preparation of the land, a judicious use of fertilizers where needed, the use of improved seed, and careful culture, would produce such an increased yield in the cotton crop that the annual crop five years hence can be estimated at 8,000,000 bales as readily as 5,500,000 for 1880." An earnest, thorough, and faithful preparation, liberal manuring, and the best seed for planting will insure this result. Add to this improved cultivation a diversified system of farming, and not only the cotton-growing, but the general agriculture of the South, will have entered upon a new and more prosperous era. Devotion to the cotton crop has so occupied all the thought and energy of those engaged in its cultivation that the owner of a cotton plantation has expected to be fed from the cereal and meat-producing sections of our country as much as has the owner of a cotton mill. It has been estimated that the cotton States were obliged to purchase last year 286,698,632 bushels of grain; being of corn, 166,684,279 bushels; of wheat, 42,252,244 bushels; of oats, 77,762,108 bushels; and, also, 4,011,150 tons of hay. This deficiency was undoubtedly due in part to insufficient acreage, but it was also due in a certain degree to imperfect cultivation. According to the last returns the average yield of corn in the cotton States was 13½ bushels to the acre; of oats, 10¾ bushels to the acre; and of wheat about 10 bushels to the acre. Now, an increase of a little more than 7 bushels to the crop of each cereal acre would have supplied this deficiency; and it does seem as if this would not be a very difficult task, considering the small amount actually produced. On the vast advantage of an increase of the cereal crops it is unnecessary for me to dwell. I cannot doubt that the grain crop of the South could be increased more than twofold without any perceptible addition to the amount of labor now employed. I am aware that the average cereal yield per acre in many other sections of the country is not what it should be, but I am now engaged in discussing this matter in connection with the cotton States alone.

But by diversified agriculture I do not mean increased attention to

cereals alone. The agricultural capacity of those States which have always been engaged in cultivating the great staple crops of our country is immense. Blessed with an abundance of good soil of every variety, and with a climate whose mildness tempts man continually to rural pursuits, there is hardly any known branch of farming into which the South cannot enter with every promise of success. Within its borders the orange and the olive find their natural homes. Here lies the sugar belt of our country, as yet half occupied and waiting for new capital and labor. To millions of its acres belongs the capacity of producing the only cotton which satisfies the demands and necessities of the most important manufactures in the world. Its corn-fields, beyond the reach of frosts, hold out an unfailing promise to the cultivator. From the shore to the mountain, the earth lies ready to pour forth abundant harvests. The elevated grazing lands of the interior furnish abundant pasturage for flocks and herds, which require no shelter from the winter's cold, while through almost every month of the year nature extends her kindly hand and invites man, not to a contest with opposing forces, but to a friendly alliance in the work of providing comforts and luxuries for all. [Applause.] In a land like this, why should the tillers of the soil grow weary in their toil? Horticulture and gardening offer great temptations to those who will pursue them in appropriate localities. For certain breeds of cattle the soil and climate seem to be peculiarly adapted. I have seen better developed Jerseys in South Carolina and in the admirable collection on these grounds than I have seen in any State north of Pennsylvania. And on every hand I have witnessed opportunities for the introduction of many branches of farming which would increase the wealth and enlarge the comforts and stimulate the energies of a people capable of adding to their one great staple a variety of crops which would make their section the garden of the world.

I am not in favor of comparisons generally, but I am sure you will pardon me if by way of illustration I lay before you an account, furnished by a local paper in my native county in Massachusetts, of a small tract of land, upon which an untiring and skillful cultivator had exercised his ingenuity in diversified farming. The Valley Visitor, published in Amesbury, Massachusetts, says:

Charles W. Woods, in Oldtown, has one of the prettiest places in the town, and he makes it profitable to farm. He has but 12 acres, and upon these he has set out 600 trees—pear, apple, peach, quince, and plum trees. He has a great variety of grapes, gooseberry, raspberry, and blackberry vines. He has gathered 100 barrels of pears. For 20 barrels of Bartlett pears he received $100. The apple and peach trees did not bear much. He had 2 acres in onions, from which he gathered 1,000 bushels; 1 acre devoted to cabbages yielded 5,000 heads, and when brought to market he realized 7 cents per pound. Two tons of squashes, 3 tons of turnips, 3 tons of beets, 10 tons of carrots, 200 bushels of the choicest potatoes, for which he obtained the highest market price, were a part of the products. He has sold $75 worth of tomatoes, $50 worth of asparagus, $50 worth of cultivated dandelions, and for melons, grapes, berries, and other products not enumerated, the sum of $300. Mr. Wood has labored every day upon his farm, and his untiring industry has brought his land to a state of the highest cultivation. He can attest that a well-managed farm will pay a handsome return.

I submit this domestic sketch of a single instance of varied industry on the land as a familiar suggestion which I am sure will attract the attention of all who are interested, not only in the management of land, but in the arrangement of a home, organized by an American farmer, landholder, and citizen. The author of an admirable and exhaustive essay in Harper's Monthly for October, Mr. Henry W. Grady [applause] (and let me tell you he is entitled to all the applause you can give him) [renewed applause]—Mr. Grady has placed this point so forcibly before his readers that I submit the following suggestions from his article, before leaving this important subject. He says:

> The first reform, however, that must be made is in the system of farming. The South must prepare to raise her own provisions, compost her fertilizers, cure her own hay and breed her own stock. Leaving credit and usury out of the question, no man can pay 75 cents a bushel for corn, $30 a ton for hay, $20 a barrel for pork, 60 cents for oats, and raise cotton for 8 cents a pound. The farmers who prosper at the South are the "corn-raisers," *i. e.* the men who raise their own supplies and make cotton their surplus crop. A gentleman who recorded 320 mortgages last year testified that not one was placed on the farm of a man who raised his own bread and meat. The shrewd farmers who always have a bit of money on hand with which to buy any good place that is to be sold under mortgage are the "corn-raisers," and the moment they get possession they rule out the old cotton plan, and plant corn and the grasses. That the plan of farming only needs revision to make the South rich beyond measure is proven by constant example. A corn-raiser bought a place of 370 acres for $1,700. He at once put six tenants on it, and united their cotton acreage to one-third of what they had under cultivation. Each one of the six made more clear money than the former owner had made, and the rents for the first year were $1,126. The man who bought this farm lives in Oglethorpe, Ga., and has fifteen farms, all run on the same plan.

And the Hon. J. T. Henderson, the able commissioner of agriculture of Georgia, says:

> Farmers are noted for their adherence to the teachings of experience, and yet there is not a county in the State in which experience does not teach the wisdom of a self-sustaining system of agriculture, and the folly of making cotton on supplies purchased at credit prices, or even for cash. The most prosperous farmers in every section of the State are those who have uniformly made their supplies at home.

And now, gentlemen, I submit these suggestions with a deep consciousness of my inexperience in the special branch of agriculture which we have met to consider. My agricultural labor and observation have been confined to that section of our country in which a hard soil and a severe climate have compelled the farmer to toil with the utmost diligence and to calculate with the utmost economy; that in which small farms and a diversified agriculture have always rewarded the industrious and sagacious husbandman. But I see no reason why my education in that field should be inappropriate here, inasmuch as good cultivation, a wise choice of land, a proper selection of seed, the skillful preparation and use of fertilizers, the breeding and feeding of well-chosen animals, are profitable everywhere in this country, North and South, and the economy of a farmer's home and a farming community is the same throughout the entire land. I am anxious, as the United States Com-

missioner of Agriculture, to encourage every step towards systematic and profitable farming, and to support the judicious views of all local authorities who are working in the same field with myself. [Applause.] The business of the department which I represent is largely auxiliary, and can best be conducted by stretching forth a helping hand to all who are endeavoring to increase the products of our soil and to improve the condition of the vast animal kingdom upon which the farmer so largely depends for his subsistence. By the introduction of new seeds submitted to the test of the farmer's experience, and by recording the results of such test for the instruction of the public; by encouraging agricultural education in all its branches, by rousing a vigorous attention to the work of making our farms attractive; by scientific investigations into the quality of soils, the constituents of the various articles of food used by man and the domestic animals; by an intelligent study of the American forests and tree culture; much may be done to aid the farmer in his work, and much to lead him away from enterprises which are impracticable and visionary. As I have elsewhere stated, I have submitted the important problems which have come before me to accomplished commissions or to careful investigation on which we can rely. The viticulture and grain-growing of the Pacific coast, the supplying of the arid regions with artesian wells, the mode of conducting forestry-schools and experiment stations in Europe, have all been submitted to competent agents for examination and report. The question of cattle disease on board the steamers transporting cattle to Europe has been presented to the privy council in England, and much has been done to satisfy the English public that the American animals shipped are free from contagious diseases. I have taken especial care that the seed distributed by the department shall be of the best quality. The Agricultural Department should undoubtedly be the nucleus around which can be gathered those associate industries which depend on agriculture for their existence, and in turn make agriculture profitable and in many sections possible. Statistical returns of our manufactures, with an illustrative display of their products, would do much to unify and develop the manufacturing industry of our country. The organization, cost, expense, and methods of our various means of transportation would do much to establish a uniform system of land and water carriage among us. Accurate surveys and returns of our mineral lands, with the industrial processes employed in working them, are of vast importance. A well organized and consolidated inquiry into the extent of contagious diseases among animals, the best method of prevention and extirpation, cannot be too thoroughly and promptly organized. And without considering for a moment the political status of such a department, I think you will agree with me that the time has come for its organization. An active, industrious, intelligent body of American citizens and producers are entitled to it, as a branch of government whose value cannot be overestimated. [Applause.]

The encouragement of all industrial endeavor in this country has a deep significance, growing out of the relations existing between the producing classes here and the system of state and society in which they live. In England the model farm selected for the inspection of Elihu Burritt consisted, he tells us, of 3,000 acres, on which "men of skill and experience, who in America would conduct farms of their own, and could not be hired at any price, may be had in abundance for foremen at from twelve to fourteen shillings, or from three to four dollars a week, they boarding themselves." The wages of manufacturing labor in the great towns of England and France are equally insufficient—an adult earning in England, under the best circumstances, about $8 per week, and in France from 70 to 80 cents per day of twelve hours. A careful investigation into the system of small landholding in France has satisfied Mr. Howard, an agent sent there to investigate it by the London Farmers' Club, that such a system is a failure and contrary to the social and civic system there. And Dr. Playfair, speaking of England, says: "Our country has shown little inventiveness and made little progress in the peaceful arts since 1862." Not so, however, here. America is the paradise of the small landholder. Labor is so well requited that its earnings constitute a large share of the deposits in our savings banks. The inventive arts are devoted to the business of easy and profitable production. A woman with her needle earns a mere pittance in a long and weary day, in which necessary confinement and toil destroy that very physical energy upon which she depends for a subsistence. With a sewing-machine she easily earns an ample income. A machinist with the tools of half a century ago could reap but a small reward; and no farmer could afford to pay the current prices for agricultural labor in harvest time were he thrown back upon the scythe, the sickle, and the flail. But a man armed with ingenious machinery becomes hundred-handed and can earn accordingly. He becomes a part of society in which he can exercise his taste as well as supply his wants. It is not the cost of a mere subsistence that we are to calculate in this country, but the amount of comfort and taste which every man can reach—good food, good clothing, a good dwelling, adorned simply or elaborately according to his means. Fortune does not smile on all men here, it is true, but when she does smile, the cheer which follows in this country is unsurpassed. [Applause.] Aided by the arts of life which surround him, the American takes his place in society, performs his civil duties, pays his taxes, aids his churches, builds his school-houses, educates his children, builds and beautifies his home, and endeavors to perform his part in life with no recognized barrier between him and the object of his ambition, which industry and perseverance cannot overcome. For him, for his opportunity, for his inheritance, as a citizen and laborer in this republic, I would encourage every industry, stimulate every mental and moral faculty, and build up and support every institution which can aid him in his work. [Applause.]

To those who have responded to this call for an industrial convention here I desire to express my obligations. It is my desire to make your deliberations a part of the record of the department which I represent, and I trust this conference may result in new determination to develop that great industry which now constitutes a large proportion of the wealth of this section of our union, and is the foundation of our national power and prosperity. [Applause.]

The PRESIDENT: I am requested by Dr. Loring to say that he would be glad to listen to any questions that may be asked or to hear any discussion upon the topics suggested in his speech—which I wish to characterize as a most eloquent and thoughtful discourse. [After a pause.] I am sure that the convention will listen with delight to the gentleman who, I believe, has been chiefly instrumental in originating this International Cotton Exposition, which we trust will prove an epoch in the progress and development of Southern prosperity. I allude to and beg leave to present Hon. Edward Atkinson, of Boston.

Mr. ATKINSON:

MR. CHAIRMAN AND GENTLEMEN: Without using the material which I hope to have the pleasure of presenting to you to-morrow, I would like to say that there are a few thoughts suggested by the admirable address of Commissioner Loring that would not have found utterance had I not been here to-day. You will remember that last year, when I dared to suggest this exhibition, I said that the kingdom of cotton had been divided against itself, and that it could not stand in that condition. There was a want of means of intercommunication between the cotton-grower and the cotton-spinner. The most encouraging thing, the most complete justification of all that has been expended here, I think, is to be found in the bringing together of these practical representatives of the cotton-manufacturing interests and the cotton-growers, and let me say that while we may be able to teach you something, I think you have taught us something. We have been inclined to undervalue the intelligence of the Southern farmers because of the condition in which we receive the great staple.

Now we find that we have here the outgrowth of peculiar circumstances, and that there is a perfectly feasible way leading to the hearty co-operation of the two branches of this great industry. I will not undervalue the intelligence of the farmers of New England, but, gentlemen, they are obliged to work very hard and very long and very wearily for the success which they attain in their business, and we find the opportunity in this southern land of yours for just that same thorough instruction, education, and experience.

There is one thing which has struck me and I think it has struck my associates, and that is that there is a very high standard of intelligence, and a very large number of high-bred men, among those engaged in agriculture here, and we believe that the one thing necessary for you is to learn

how to avail yourselves of the mechanical appliances, improvements, and methods which we have so much desired. At the suggestion of Commissioner Loring at our final meeting this morning before separating, a committee was appointed, consisting of three of our most practical and intelligent manufacturers, to co-operate with the commissioner and any committee of planters or farmers that might be appointed, for the purpose of considering certain conditions and qualities of cotton, and of bringing into prominent view and explaining to you what the manufacturer needs, and what are the different needs of the different manufacturers. We find here evidence of the existence of exceedingly valuable varieties of cotton adapted to different fabrics and to different work, but the difficulty is, that they get merged and mixed up in the great warehouses, and they can never again be separated as they could have been at the start, and hence some of the most valuable varieties of upland cotton which can be identified in the plant and bale, get mixed in with the miscellaneous, and are never discovered until they reach the mill where they finally land. Now, there are men here who would pay a much better price for that variety of cotton than you really get for it if it could be delivered to them in proper uniformity.

Another suggestion has been made to me. There is a great variety of new implements, new gins, new processes, some of them crude, some of them containing germs of remarkable ingenuity, and some of them much nearer perfect than we had anticipated. Now, there is one thing we claim for our side. We know more of mechanism than you do, and you are liable to be misled to adopt things which appear on the face to be valuable, but which, when put to practice, you find do the work no better, if as well. Through this you are discouraged and inclined to abandon all ideas of improvement. Now, before this meeting adjourns we hope to see the appointment of a committee of experts on behalf of both branches represented here to-day, to consider mechanical inventions, to say, in the first place, what is good, and next, to say if it has been mechanically well carried out and well constructed. By this means you can be governed in the selection of machinery and enabled to furnish us with those particular varieties and qualities which we are all anxious to receive, and for which we are willing to pay an extra price.

We see, also, signs of some progress in the prevalence of the idea that good cotton pays. The fault heretofore has been in the conviction, which I am afraid has been quite general, that a bale of cotton was a bale of cotton to be sold for its price. In practice you are wrong. For every quarter cent's worth of foreign matter you leave in a pound of cotton you pay three-eighths—or perhaps half a cent in the long run.

Now, my friends, you can't do this with us without being found out. We will catch you every time, for it is the necessity of the business. You will get your price and your value for every pound of cotton sent us in the proper shape. Now, we would like you to adopt the Chinese method (and we have to go a good ways off to learn a lesson even in so

small a matter). In every package of tea sent out there is put the card of the man who grew and cured that tea, and every package can be traced back to some one who is responsible for its condition. Now, if you gentlemen who grow cotton want to find out if you are doing it well, and want your money for it accordingly, I suggest that you pick your cotton as well as you can, keeping in mind uniformity of staple, no matter whether it is long or short, but don't let long and short go into the same bale. Pack each bale with its own kind. Draw your sample from the middle of the bale and put your card there, with the number, address, and name. Fasten a duplicate card to that sample and send it to any of these gentlemen whose names you have on record here, asking for its cash market value, and you will find when you have your money that you have realized more for it than you ever obtained in any other way.

Understand me, I don't say that you can supply the 200,000 or 300,000 bales which these gentlemen mark in this way, but Mr. A, or Mr. B, or Mr. C, either of them, will realize 10, 15, or 20 per cent. more than he could by merging the best in with the miscellaneous lots in the warehouses.

Mr. KIMBALL. I desire to move that Mr. W. H. Ketcham, delegate from the Cotton Exchange of Mobile, and H. A. Arthur, delegate from the Cotton Exchange of New Orleans, be added to the committee which has been suggested as soon to be organized.

Mr. ATKINSON. I am requested by one of the oldest of the cotton spinners here to say that if there are any gentlemen here who would like to make any inquiries of him he would be glad to meet them and answer any questions.

Mr. KIMBALL. I wish to state that Professor Riley, who is connected with the Department of Agriculture at Washington, is present by direction of the department, and has brought with him a large amount of apparatus which he desires to explain. This machinery is to be used for the extermination of the enemies of the cotton plant. The professor is in the hall, and if you will bear with us for a little while longer we will be glad to have him come forward and make any statement he may desire. The apparatus itself is just adjoining this building, and I have no doubt it will be of great interest to many of those present.

The PRESIDENT. You have heard the statement just made by the Director-General with reference to the instruments which Professor Riley wishes to exhibit for the extermination of the cotton worm, and we shall be glad to listen to the professor's statements.

Mr. KIMBALL. One moment. There need be no delay in this general discussion. Let that continue as long as desired.

After a pause the president recognized Professor Riley, who said:

Since you have called upon me I would like to state that I should much prefer to see discussion go on. If the convention does not adjourn to-day I shall be glad to present them later, but I fear it would be tedious should I do so now.

The PRESIDENT. Do you wish to exhibit the machinery to-day?

Professor RILEY. Any one who desires to see the machines, as far as we have perfected them, can do so by going down underneath this building. They have been perfected under the charge of Professor Barnard, and he will undoubtedly be very much pleased to show and explain them to any one present.

The PRESIDENT. The subject-matter before us is the discussion of any questions connected with the culture and manufacture of cotton, the getting of it to market, and all the matters suggested by the address of Dr. Loring and the speech of Mr. Atkinson. There is nothing before the convention at this moment.

A MEMBER. I move, Mr. President, that we do now adjourn.

A MEMBER. Before that motion is acted upon I desire to move the sincere thanks of the Convention to Dr. Loring, the Commissioner of Agriculture, for his able address to us to-day.

The motion was unanimously agreed to, and then, at 1.50 p. m., the convention adjourned.

NOVEMBER 4, 1881.

In accordance with previous announcement, the Cotton Convention reconvened in Judges' Hall at 12 o'clock.

Judge J. T. Henderson, State commissioner of agriculture, presided, and called upon Col. T. C. Howard to open the meeting.

Mr. Howard said:

FELLOW CITIZENS: It is not only a pleasure but a profound pride that I have in being able to introduce to this community a gentleman whose reputation, in connection with the topic upon which he is to address us to-day, is as wide as the world itself; and as wide as it is, it is no less deserved than extended. I beg to introduce Professor Riley. [Applause.]

Professor Riley said:

MR. CHAIRMAN, LADIES, AND GENTLEMEN: I came here, as entomologist of the Department of Agriculture, to practically test in the field machinery that we have been perfecting to protect the cotton crop. The part I take in this convention of cotton-growers and manufacturers is therefore incidental. It was intimated to me by the worthy director-general of this magnificent exposition that I should be called on for remarks, but no idea or suggestion was given as to the nature of the remarks required. It is usually taken for granted, however, that when I address an audience the subject will in some way be connected with entomology, a subject which it is difficult for me to treat of without reiterating facts which I have elsewhere presented.

Insects have an important part to play in the economy of nature. They act as scavengers in removing offensive animal and vegetable material which would otherwise poison the air we breathe; they fertilize our

plants, many of which could not, indeed, exist without their insect pollinizers; they furnish food for hosts of other animals; and in many other ways are indirectly beneficial to man. Nay, they are essential to his very existence; for if some of the lower supports in the complicated structure of the living world which has man for its apex and outcome were to be removed, the whole structure would topple over or collapse. We also receive some direct benefits from insects, as the honey, wax, lac, silk, cochineal, cantharides, &c., of commerce bear witness; but the direct benefit which man derives from insects is insignificant compared with the immense injury which he sustains from species which ravage his crops, and it is in the economic bearings of entomology that the science assumes an importance to the agriculturist that commands his attention, however little he may be interested in the other bearings of the subject.

Whenever we begin to carefully estimate the losses which, as a nation, we sustain from insect ravages, the figures always startle, and you will doubtless be surprised to learn that they have reached in a single year nearly $400,000,000.

Now it is, in my judgment, one of the highest privileges and prerogatives of the entomologist to be able to point out to the farmer how his insect enemies may best be controlled; *i. e.*, how best to decrease their injury and save to the nation as much as possible of the vast annual loss it sustains thereby. I say this, because there are men who think that it is beneath them and ignoble to make practical application of science; and the average entomologist deems that he is doing far nobler work in describing some new species, or in theorizing on some problem of classification, than he who, studying life's wonders or patiently unraveling some biological problem, discovers truths of practical moment to man, and which serve to promote the general prosperity of the people.

METHODS OF COUNTERACTING INJURIOUS INSECTS.

The means within man's power in combating his insect enemies are twofold—preventive and curative. The first is infinitely the most satisfactory, and always requires exact entomological knowledge of the particular species to be dealt with. The cure of the evil is also often impossible without special entomological knowledge, but gives scope in addition for mechanical and chemical experiment. It may also be brought about by the encouragement of the natural enemies of the insect to be dealt with.

It often seems as though man were utterly powerless before some particular insect as it sweeps over his fields with irresistible impulse, carrying destruction in its wake, and the disposition in face of any general calamity of this kind is too often one of passive acquiescence in what is considered inevitable. Such visitations are too often looked upon as dispensations of Providence which it is futile to oppose, and proud man too often acknowledges himself helpless before his foe—so insignificant

individually, collectively so mighty. Yet in the majority of cases this helplessness is the result simply of ignorance. There is a weak and vulnerable point in the life of every insect, if we can only manage by study and perseverance to discover it.

Let me now, gentlemen, make a direct application of these general remarks by taking for my immediate text two insects which, as cotton-growers, you are more particularly interested in, viz, the cotton-worm and the boll-worm.

THE COTTON-WORM.

You all know some things about this insect. Under the various aliases of cotton-worm, caterpillar, army-worm, or old French *chenille*, it has been a dread to the cotton-grower of the United States since the beginning of the century. A native of Central and South America, its advent in the northern portion of the continent was no doubt coetaneous with the introduction and cultivation of cotton. Appearing in destructive numbers at irregular intervals, it was looked upon as an unmitigated evil entirely beyond man's control.

The most careful statistics, compiled at my request by Mr. J. R. Dodge, the leading agricultural statistician in the country, show that during the period from 1865 to 1879 the average annual loss to the cotton-growers from this cause was fifteen million dollars, while in some years it reached nearly double that sum. On the principle of "a penny saved is a penny earned," this is so much stolen from your pockets. Since 1879, notwithstanding increased acreage, the loss has been less, owing to the more general adoption of methods for repressing the worm. It at first seems astonishing that with such large losses to the staple crop no systematic attempt should have been made to overcome this, the planter's worst enemy; that no enthusiastic naturalist should have arisen among you, either before or after the war, to take hold of the problem, and at least summon all the aid that science and intelligence could bring to bear to solve it.

But whatever the explanation, the fact remains that up to 1873 the planter was practically at the mercy of this Aletia, while up to 1878 there existed a vast amount of theory and scarcely any exact knowledge relative to its nature and habits. A few Southern men like the late Thomas Affleck, of Brenham, Tex., and Dr. D. L. Phares, now of the State agricultural college, at Starksville, Miss., had written intelligently of what they had observed in their own limited regions, but without laying claim to that general entomological knowledge and experience which was necessary, whether to correct interpretation of the manifestations or the practical solution of the problem. Prof. Townend Glover also did his very best work in this field, but the practical outcome had been the use of fires and lamps to attract and kill the parent moth—methods, at the best, more or less unsatisfactory and ineffectual in preserving the crop.

In 1872 I suggested the use of Paris green to destroy this pest, and in 1873 confidently recommended it for the purpose, in an address which was very generally copied in Southern journals. The planters in the more southern portions of the cotton belt, who, after the war, and while struggling against many adverse influences, had seen their crops ruined year after year, and had become well-nigh discouraged, hailed this remedy with profound joy, and many were the touching expressions of appreciation and thankfulness which I received from various quarters. Men more zealous for their own gain than for the public welfare patented various combinations of Paris green and other arsenical poisons, and did a lucrative business in selling rights to use their various compounds under names that conveyed no idea of their nature. They all had arsenic in some form as base, and feeling that the patentees were, in great measure, imposing on the public, I used my pen and influence to stay the impositions. The period between 1875 and 1878 was one of activity in the improvement of appliances for using the poisons, but they all had for their object the throwing of these last, in liquid or powder, broadcast over the plants.

Although I had long felt that the subject was one of the greatest importance, well deserving the attention of the national government, the opportunity to begin a thorough investigation of it was first offered in 1878, when, as entomologist to the Department of Agriculture, and with the hearty assistance of Senator Morgan, of Alabama, and other Southern Senators and Representatives, I secured a small appropriation of $5,000 for the purpose. The investigation has not been without obstacles and difficulties. During the first two years the prevalence of yellow fever was an impediment, and as the most interesting sections, from the cotton-worm standpoint, are the most malarious and unhealthy, and observations must be made during the night as well as by day, few of my agents have escaped sickness after a summer's work in the field. Professor Barnard, who is here with me now in charge of the machinery on exhibition beneath this hall, and to whose perseverance and ingenuity we owe various important mechanical contrivances, was so seriously ill at Selma last fall that I at once almost despaired of getting him back safe to his home in the North. I mention these facts because the synopsis of results which I shall now endeavor to present to you will convey no adequate idea of the time and labor involved in getting at the truths which, once obtained, appear simple enough. "What is missed is mystery, what is hit is history," and you have all no doubt laughed at the simplicity of some feat or trick of legerdemain after it was once explained, where before you had puzzled your heads in vain for the explanation. Nature's truths are all simple when we have once learned to read them, but the key to unlock them is generally revealed to us only after much patient and intelligent search in field and laboratory.

Here [pointing to diagram] you have illustrated a worm which you are all more or less familiar with in its general aspects and its consequences. It belongs to the same order (Lepidoptera) as the silk-worm. The one industriously spins for us that most lustrous and unequaled fiber that plays such an important part in the commerce of the world, and was for a long time a fit emblem of royalty; while the other is bent on destroying that fiber which, though less rich and costly, is more important to the multitude. The one by study, experience, and experiment, man has succeeded in artificially propagating; the other, by the same methods, he may succeed in destroying.

Omne vivum ab ovo. All life comes from an egg. Modern science confirms this Linnæan aphorism. Our cotton-worm invariably hatches from an egg, and the very common belief among planters that it has a spontaneous origin, or in some way comes from cotton-seed, is childish. The egg is 0.6^{mm} wide, circular, much flattened, and ribbed. Bright, bluish-green in color when first laid, it is attached singly to the under side of the larger and lower leaves, and is easily overlooked. In from two to four days after being laid—the time varying with the season—the young worm hatches. It feeds for a few days upon the under side of the leaves, making yellowish and semi-transparent blotches. These, to the well-posted planter, betoken its presence, where otherwise it would remain unnoticed. It sheds its skin five times and acquires full growth in from one to three weeks after hatching, according to the season. It riddles the cotton leaf only in the latter half of its worm-life and eats more during the last two days than during all the rest of its existence. I want you to bear this fact in mind, as it explains the apparently sudden appearance of the worm, so often remarked upon. When full-grown the creature spins a slight web, usually in a piece of rolled-up leaf, and becomes a chrysalis, which from its nature must always be formed above ground and cannot burrow beneath the surface of the soil. This state lasts on an average about one week in midsummer, but two or three times as long in spring or fall. In due time the moth or imago issues. This moth has a series of wavy, lilac-colored or crimson lines across the somewhat olivaceous front wings, which generally have a clay-yellow or faintly golden cast, but it is chiefly distinguised by a dark oval spot on the disc of each wing, and by three minute white specks dividing the space between this dark spot and the shoulder in three equal parts. It rests with the wings forming a straight line along the back. It is nocturnal in habit, resting during the day and taking but a short, startled flight when disturbed. In the early part of the night it is busy feeding and hovering from plant to plant, in flight contrasting strongly with its darting day-flight. In the latter part of the night and small hours of the morning the sexes pair and the female is engaged in ovipositing. Its food is chiefly the saccharine

exudations from certain glands on the under side of the midrib of the leaves and at the bases of the outer lobes of the involucre, though it will feed on all sorts of other sweets and is capable of fretting the surface and sucking the juices of fruits.

The time elapsing from one generation to another varies according to temperature, and therefore according to season. There is increasing activity and acceleration in development from the first appearance till July, and thenceforth decreasing activity and retardation in development till frost. Thus in midsummer the whole cycle of individual life, from the hatching to procreating, may occupy less than three weeks, while in spring and late autumn it may occupy twice that time. Taking the whole season through, however, the time from the egg of one generation to that of another will average about one month.

The first worms appear much earlier than was formerly supposed, viz, from the middle of April till the middle of May, in the southern portion of the cotton belt. The fact that these early worms generally attract no attention, and that the species seldom acquires disastrous force till the third generation, has given rise to the erroneous notion of later first appearance. There are also many more generations than has been supposed, seven or more being produced toward the Gulf, the last enduring till frost cuts it off. When I tell you that in addition to this rapid succession of broods the moth is one of the most prolific with which I am acquainted, capable, in fact, under favoring circumstances, of laying six or seven hundred eggs, you will no longer wonder at its destructive capacity. The progeny of a single female may, in less than two months, under the influence of midsummer temperature, reach twenty billions, while you all know that half a dozen worms to a plant are sufficient to jeopardize the crop. Why, were it not for the various natural checks upon the increase of the species in geometrical ratio, successful cotton culture, with all our improved methods for destroying the pest, would be utterly impossible. Remove the barriers and the flood comes. The occasional impotence of the natural checks, through one cause or another, very quickly gives the Cotton-worm the mastery in the struggle for existence and precipitates it upon us in multitudes almost as if by magic.

I have frequently referred to the southern part of the cotton belt, because the insect acts differently in the southern portion of the belt, where it hibernates, from what it does in the northern portion. Here it appears later and only after having become excessively multiplied further south. The dividing line between these two portions has been approximately given in my bulletin on the cotton-worm.

The manufacturers here present have laid stress on the importance of cleansing your cotton from sand, leaf, and other trash before shipment, and Mr. Atkinson emphasized the point in his address yesterday. It may not be generally known that it is the gnawing of the worm which causes the staining and fragments of leaf in the cotton, and that this is much more difficult to remove in ginning than sand or earth, and I wish

you particularly to bear in mind that for this reason the destruction of the worm will pay you ten times its cost, even when the worm comes too late to otherwise injure the crop.

Now, I feel that I have got on to a theme of great concern to you all, but I must pass over many questions of interest, if I am to reach the chief object of my remarks. To treat of the conditions of soil and plant most favorable to the Cotton-worm, the meteorological influences affecting it, the migrations of the moth, the manner of hibernation, the parasites and other natural enemies, would require many hours' time, and I must pass them by for the present. Before proceeding to the more practical considerations, however, I wish to say a few words, by way of comparison, about another important enemy of the cotton crop, viz, the boll-worm.

[The professor's remarks were here illustrated by colored diagrams. He gave an interesting account of the Boll-worm, showing its habits and character and how it differed from the Cotton-worm in transforming underground, in the manner in which the moth rests, and in other particulars, but that the two resembled each other in both feeding at first on the under side of the leaf.]

From the facts here presented it is obvious *that poisons applied to the under surface of the leaves will accomplish far more good than when thrown on the upper surface*, as has been the common custom. They will more surely kill the young worms before these do any damage; they will tend to kill the moths, and they will likewise kill the young boll-worms. Time will not permit me to go into details as to the different substances that may be used for the destruction of these worms. It suffices to say that of the tons of different ingredients that we have experimented with, Paris green, London purple, or arsenic in some form, give the most satisfaction, while the only vegetable product that gives any promise of usefulness is Pyrethrum, prepared from plants indigenous to parts of Europe and Asia, and the cultivation of which I have been endeavoring to establish in various parts of the South.

IMPROVED APPLIANCES.

"Planters will apply poisons either in liquid or in powder, according to circumstances and conveniences. The wet method, according to present practices, is the more expeditious, and the safer so far as injury to man and stock is concerned. It acts less favorably in wet weather, the first outlay in appliances is greater, and they are often useless where the soil is heavy and wet. The dry method can be most advantageously used in wet weather, and the application is most persistent; the cost of diluents has heretofore been great; there is more danger to the operator, and an acre is poisoned less quickly.

"Experiment shows that in the broadcast methods of sprinkling there is a limit to the subdivision of the liquid beyond which it cannot practically be carried, both on account of the greater tendency of the nozzle

to clog and of the greater specific gravity of the poison compared to water in fine spray; so that in attempting to throw fine spray over ten or twelve rows, the outer rows receive no poison. This last obstacle applies less to pyrethrum, which has least specific gravity. In using the poisons dry, it does not seem possible to advantageously diminish the amount per acre by any present appliances, but I have reason to believe that a diluent of simple earth well dried and pulverized may be used with as much advantage as any more costly."*

POISONING FROM BELOW.

Now, the throwing of poison from below has enabled us to diminish much further the quantity to be thrown on the plant in either method.

The old-fashioned punctured sprinklers, and perforated or gauze sifters, with which all are familiar, have proved impractical, because of the fine holes becoming clogged by wet poison and other materials. To prevent this, stirring, shaking, and straining appliances have been combined with them, but without as good results as we desire.

What may be called slit-nozzles have been made in numerous forms. The fluid, being squirted out through a slit, expands in a fan-like shape, and thus breaks up into a sheet of spray. The fissures have been cut in different angles and curves to produce several kinds of jets, and some can be enlarged or reduced by an adjustable screw. Where large sprays for broadcast sprinkling are desired, and the opening may hence be coarse, these answer admirably; but for very small sprays, such as are needed in poisoning cotton from beneath, the slit must be so fine as to clog. To remedy this difficulty we have introduced an improvement adapted to all nozzles of this class. The fluid is forced into the round nozzle chamber through a tube or hole tangential to its circumference, thereby causing an intense whirling motion against the inner surface and its slit so as to wash away and keep in action the particles which would otherwise tend to accumulate upon and clog the narrow outlet. The nozzle chamber can be easily opened to remove what collects within.

Lip nozzles are such as spread the liquid into a shower by squirting it against an inclined surface or lip, which may be formed to reflect in one plane, or made angular so as to throw it in two or more planes, or conical to produce funnel-shaped sprays.

Nozzles of this class are excellent for broadcast sprinkling. The lip resists the fluid after it is freed from the pressure, thereby retarding it slightly and causing a little to waste by dripping or falling in large drops unless forced with great velocity. We have used an additional pipe to catch and return the drips.

Rotary nozzles are of several kinds. Those in common use, as lawn sprinklers, work on the principles of Barker's mill and of the windmill. The water striking the inclined surfaces of a rotary part makes it whirl so as to throw and break the fluid to pieces. Then there are ordinary

* Quoted from a paper read in 1880, before the Am. Ass. Adv. Sc.

tubular hose nozzles with the caliber rifled for all or a part of their length to give a spiral movement whereby the fluid is thrown into a spray.

The rotary nozzles noticed are only available for broadcast sprinkling; but we have perfected one and named it the cyclone nozzle, which is not only suited for the same purpose by atomizing fluid fine, and in any volume, but which is well adapted for spraying the foliage beneath. The round nozzle chamber has a tangential inlet, and at right angles to this a round central outlet. Fluid forced through it wheels with an incomprehensible velocity in a volute course to and through the central orifice, producing a broad, fine, beautiful spray. This nozzle is the best yet invented for spraying.

Machines for throwing poisons may be arranged in four natural classes:

1st. Brush-throwers.

2d. Rotary fan blowers.

3d. Bellows blowers.

4th. Squirting machines.

I must omit consideration of the first three (though you will find on the grounds many ingenious improvements which we have made in their application) and confine my remarks to the squirting machines which are the most valuable for our purpose. A great many kinds of force pumps have been tried. The rotary seems best suited to combine in machinery, but as yet we have none cheap enough for the planter. Among the piston pumps several are cheap and work well, as Whitman's fountain pump, the Little Giant, Ruhmann's, &c. No improvements of much value have been recently added in the pumps which are suited for our purposes. As a rule the simplest are the best and cheapest.

But the greatest advance in this line is shown in our automatic sprinkler, which entirely does away with the labor of operating them. A windlass arrangement elevates the barrel of poison so high that gravitation supplies the spraying power. Probably no more simple or practical method than this can ever be invented, and it will remain a standard process.

Fire extinguishers worked by gas pressure have been tried for spraying fields, but those in use are too expensive and waste an unnecessary quantity of chemicals. We have an improved method of spraying plants by gas pressure which is cheap and easily managed.

We have a rotary fan blower in combination with diverging pipes ending in forked lips and mounted on a triangular tripod frame with hind swiveled wheels and front gearing, with belt to move the fans at 2,000 revolutions per minute.

We have rotary fan-blowers for throwing fluid poison. We have bellows-blowers in combination with a plow or cultivator, whereby the cotton may be poisoned while it is being cultivated. We have, further,

compound fountain sprinklers through which the water may be forced by a pump or by gas pressure or by gravitation. In the simplest and best machine we have contrived the water is forced through a system of dichotomously branching tubes, the last fork flexible so as to hug and sprinkle two rows from beneath. The flexibility allows no breakage in pipes, and the trailing flexible forks adapt themselves to crookedness and variations in the width of rows.

The advantages of the triangular, tripod, tricycle frame are that it conforms to all irregularities in all directions. It cannot well tip over; it forms the base of a pyramid supporting the barrel of poison; it turns easily and short as upon a pivot: it pulls easily and it opens and shuts to suit the width of the rows.

With this machine from twelve to twenty rows of cotton are easily and effectually poisoned from below at a minimum cost of machinery, and with the minimum quantity of material.

As a few minutes spent in witnessing the working of this machinery on these grounds will convey a better idea than any amount of further description, I will detain you no longer, but earnestly invite you, upon adjournment, to examine it. With a first outlay of from $10 to $15 for machinery, not more than one cent per acre for material and the labor of one man and a team, one hundred and fifty acres of cotton can be poisoned and protected in a day. What more, gentlemen, can you desire?

No one feature of this marvelous exhibition, which does so much credit to the projectors and managers, has interested me more than the trial ground, where your Southern crops and cotton from all parts of the world are under cultivation for comparison, and I felt an intense mortification when I found upon arrival here that this cotton was all defoliated by the worm. Estimating that the plot contains two acres, it could have been protected in less than an hour and with less than a dollar's outlay, and it would have been a veritable pleasure to me and a most telling practical lesson to you to have seen that interesting patch of cotton now in full leaf, while destruction was all around, and it should have been had I known of its existence in time.

There is one other fact I desire to call your attention to before taking my seat. The work we have been doing on this cotton worm is not sectional. The appliances I have described to you, which have been perfected ostensibly for the benefit of the South, will benefit all sections of our country, for they are applicable to the potato crop and to many other crops. I wish our legislators to bear this in mind, for our work in this field illustrates what has proved true in many other fields, viz, that what benefits any particular section redounds to the common good.

I thank you, gentlemen, in conclusion, for the attention you have given to these fragmentary remarks. I have shown you but the barest outline of the many interesting and important questions raised by the consideration of a single insect. What I have said is simply suggestive

of the many things that have necessarily been left unsaid, and my object will have been fulfilled if the remarks lead to questions from the practical planters here congregated and to profitable discussions. The cotton-worm is but one of many insects that affect your staple; cotton is but one of many products which form the basis of our prosperity as a people, and which are all more or less affected by insect enemies which call for attention from the entomological division of the Department of Agriculture. This division, again, is but one of several embraced in that department, which has for aim the amelioration of the farmer's condition and the advancement of the greatest of all industries.

At the close of the address and in accordance with its closing suggestion the planters adjourned to examine the machinery, which was explained by Messrs. Riley and Barnard. Upon reconvening the following discussion took place:

Mr. WARNER, of Austin, Tex.:

Mr. CHAIRMAN: While Professor Riley was speaking, a member asked how he would kill these worms. I want to answer that question. The way I should kill them would be with one of my saddle sprinklers.

Professor RILEY. I should like very much to hear and answer any questions that may occur to any gentlemen present. I am sure there are those here from whom I should be glad to hear relative to their experience.

A MEMBER. If your cotton is under the control of the worm, about what would be the cost of Paris green to rid yourself of them?

Professor RILEY. In the first place I wish to urge upon you, as cotton-growers, the important fact that you never should allow the cotton to be under the control of the worm. The poison should be applied long before the leaf is eaten, but in a field that is being absolutely defoliated the expenditure for Paris green would be from 25 to 50 cents per acre, according to the varying market price of the green. A pound to forty gallons of water is required, and with the improved cyclone nozzle, which you have just seen, forty gallons will go over several acres. It would be hard to estimate the exact cost. Of course it would depend largely upon how conveniently you have water. Any one can get a barrel and any one can get a tinsmith to make him one of these nozzles. We have not figured out the exact cost, but every one may judge for himself according to circumstances. The cost of material must in any event be very small, almost infinitesimal. I will say further that London purple is much cheaper than Paris green. It is a refuse obtained in the manufacture of analyne dyes, and is what I recommended 3 years ago. It is sold by the manufacturers, Hemingway & Co., of New York, at 6 cents per pound. One-half pound is sufficient in a forty-gallon barrel of water. With the cyclone nozzles attached to a wagon and

worked with a small force-pump, as in the manner we have exhibited, one barrel will suffice for from four to seven acres of cotton, according to the size of the cotton and the height from the ground the spray must be forced. We can easily go over seven acres per barrel of such cotton as you have in this section. Suppose your half pound of purple cost you 5 cents. the first cost of material even then is less than one cent per acre, and two men, with the team and wagon which I assume all planters have, can conveniently poison from 8 to 16 rows as fast as the team will walk, and according as the fields are large and level or otherwise.

I might dwell a long time on Paris green and other poisons, but I will only say, use whatever is the cheapest. If you can't secure London purple or Paris green, use arsenic according to the published formula.

A MEMBER. I would like to have this discussion take a wider range. I am satisfied that the cost of the mere application is very insignificant. Now, the small farmer is as much interested in this matter as the large one. I am from a section where the small planter abounds; call them one-horse farmers if you choose. Now suppose that I am such, and my crop does not exceed six or eight bales of cotton: how may I avail myself of this machinery? What would be the cost of the machinery, the most available for my purpose? I can see one way out of it. We can encourage a man of means to buy a machine and poison our plants for us. Now, I want to know something about the cost of this machinery available to the small farmer, and whether we will have to engage a man to buy a machine and come to us for the purpose of poisoning our plants.

Professor RILEY. One of my reasons for congratulation is the cheapness of the apparatus. There is not a planter who cultivates two acres who would not find it to pay him well to rig up a machine after some one of the patterns you have seen. Any small farmer can have a tinsmith make these nozzles. If he has 2 acres only he can manage it by using an ordinary force-pump, and go between the rows on foot, spraying two rows at a time.

Mr. HENDERSON. What would be the whole outlay for necessary machinery and poisoning fluid for, say, a one-horse farmer, 10 or 15 acres of cotton.

A MEMBER. Say twenty acres.

Professor RILEY. It ought not to cost more than 25 cents an acre, at the very most. Mr. Warner, who is here, has a saddle sprinkler. I don't know what its price is, or what it can be manufactured for, but even if it be more complicated or more expensive than many of the contrivances which you have seen, it would well pay a man to have something of the kind on hand so as to be ready in an emergency to go in and kill the first worms that show themselves. Mr. Warner's sprinkler is a most ingenious one and among the very best invented, and I feel complimented that he thinks so favorably of our cyclone nozzle that he has rejected his own and substituted one of ours. His saddle pump

throws the poison on the top of the plant, and possesses in common with all machines that do likewise the very defect I have been studying to remedy in the contrivances here for spraying from below, and for the reasons set forth in my address. It will be difficult also to keep the poisoned liquid from getting onto the rider and injuring him through the chafed parts between the legs. The question of cost is very much a question of conveniences. If water was not convenient, I would rig up some such contrivance as we have on the cultivator. If I had water convenient I would use the barrel tripod. If it was a large field; if I desired to poison 100 acres or more of cotton, as it grows in South Alabama, Texas, and Mississippi, I would consider it not only advisable but essential to use the best contrivance I could get. In proportion as you have a large number of acres of cotton to poison it will pay you to rig up more perfect machinery. If I had a large number of acres I would not hesitate to use the force-pump and wagon. If a small farmer, and water is not accessible, let him mix half a pound of London purple with 30 parts of flour or ashes or plaster, and dust his plants with an ordinaary muslin bag. He can poison, in this manner, an acre of cotton in less than an hour, or about an hour. That will give you an idea how cheaply it can be done.

Mr. HENDERSON. You say 25 cents an acre; does that include the cost of machinery?

Professor RILEY. I intended to include machinery and labor, but I have not estimated it closely, as so much depends on the number of acres. However, half a pound of London purple put into a barrel of water can be applied by taking a bucket along with you, and an old whisk broom. If you want to expedite matters and save labor, use the simplest and cheapest machine you can get.

A MEMBER. Will any part of that poison falling on the eyes injure you in any way?

Professor RILEY. London purple is not so poisonous as Paris green, but there is no danger with either in water, unless you allow too much to come in contact with the eyes, or sore spots on the body.

Mr. HENDERSON. Have you ever seen it applied where the caterpillar has already taken possession of the field?

Professor RILEY. Yes, often; but some of the practical farmers here could give experience on that question better than I can.

Mr. HENDERSON. I think Mr. Smith-Vaniz, of Mississippi, is here, and I would like to hear from him.

Mr. SMITH-VANIZ. I think the worm can be easily destroyed. I have successfully saved my cotton the present year by poisoning, whereas cotton not poisoned adjoining was utterly defoliated. The poison was applied twice on one piece of cotton, and on another piece it was only applied once, to see what effect that would have. Notwithstanding it rained several times, no damage was observed, except to the crop not poisoned, which was eaten up by the worms.

Mr. HENDERSON. Could you give us an idea what it cost you?

Mr. SMITH-VANIZ. No, sir; my brother and myself worked together.

Question. What was the poison you used?

Answer. London purple; it was billed to us at 6½ cents a pound.

Question. About how much to the acre—less than one pound?

Answer. Yes; we mixed it with water, according to Professor Riley's instructions.

Mr. HENDERSON. What kind of worm?

Answer. It was the *Aletia argillacea*. It was what is generally called the army-worm.

Mr. HENDERSON. Did that destroy all worms alike?

Answer. Yes; it also destroys the boll-worm.

Question. Suppose it be applied to cabbages?

Professor RILEY. Gentlemen I could not of course in the brief space of an hour go into all the phases of this subject, but the work done for you cotton-growers in this matter will incidentally benefit the whole country. I am willing to assert that there is no section of the country that will not be benefited by the discoveries we have made in connection with the cotton plant. The same appliances precisely will answer for many other crops, as cabbages, potatoes, &c., in other sections of the country, and I am glad the question has been brought up as this fact needs to be emphasized.

Mr. HENDERSON. I would be glad to hear from Mr. Warner, who claims to be the inventor of a worm-exterminator.

Mr. WARNER. I was invited to come here from Texas by Professor Riley, who asked me to bring my machine with me. I have come and have been treated with the greatest kindness. I am going to give my experience and I shall endeavor to be short. In the first place I have tried several years to learn how to kill the cotton-worm. Its habits and customs I have learned from reading the professor's reports, but the machine I use I invented myself. I tried it last year successfully. I live at Houston, Tex. I was invited by one of my neighbors to take my machine over to his house. He had 500 acres of cotton and the worms were all over it. I had taken three of my saddle pumps with me. His laborers took hold of them and in half an hour they had learned how to work them. They went into the field and killed all the cotton-worms. Mr. Thompson came to my house immediately afterward and made a calculation of the cost. He estimated the labor per day, and the expense of his poisons. We made it cost us 28 cents an acre, and we killed 25 acres a day. A gentleman came into town not long ago and asked me how much I asked for my machines. I sold him one and afterwards he told me he had saved at least $18.

Mr. HENDERSON. Do you use the same fluid preparations?

Answer. We use a poison composed of arseniate of soda and dextrine.

Professor RILEY. I want right here to emphasize one of the points I made in my remarks. That is, we must be on the lookout for these worms.

Many of you have been surprised because in ordinary years you were not troubled with them. Your manufacturers from the North have complained to you that you send them too much trash cotton. You know as well as I do the injury done by the worm and how very great it is. But the injury is not alone to the leaf. The gnawed particles of the leaf get into the cotton when the worms come late, and very materially depreciate the quality of the staple. Had the superintendent who had charge of this sample patch which was lost by the worms been from the extreme southern portion of this State; had he been from one of those parts of the cotton belt where they have to poison annually in order to save any part of the crop; had he, in other words, had more experience with the worm, he would have been on the lookout for them the moment he heard of their occurrence in the neighborhood, and he would have witnessed those little pale blotches on the under side of the leaf and that would have been the time to poison and thoroughly protect the crop, long before the larger worms had enforced public attention. Mr. Warner's saddle sprinkler, which costs $25 or more, would undoubtedly have saved this crop, as it is handy to ride into a field with and use upon an emergency; but he will pardon me if I say that my aim has been to reduce that cost of $25 to the small cotton-growers. I want to make it possible for them to rig up their own appliances and machinery without having to pay even $10, and I want to give the large planter something more effectual, satisfactory, and expeditious. As I have said before, the cost depends upon the number of acres you have to poison. The first cost diminishes until at last, if you have 500 acres, the cost of even the best machinery we have on exhibition here would be trifling.

Mr. Warner. What would it cost?

Answer. I believe an ordinary blacksmith could rig up our wagon attachments or the self-acting tripod sprinkler for about $15.

Mr. Henderson. You don't mean he could include the force-pump?

Answer. Yes, sir; you can make it very small, as very little force is needed with our nozzles; and we have one automatic pump that works well by the motion of the wagon wheel. I would like Professor Barnard to give his opinion about its cost.

Professor Barnard. We can make one that will not, with the other machinery, cost more than $20, and perhaps not over $15.

Mr. Warner. A gentleman here wants to know if I have a peculiar saddle. I have one machine which requires a peculiar saddle, and I have one that you can use on any ordinary saddle. As to its being expensive, I will at any time furnish a gentleman with one if he will give me one-half of the cotton that he will save by its use in one-half a day.

A Member. I want to ask one question with reference to keeping the poison stirred in the water; we may begin with the poison very much diluted, and yet before we get through there is too much, and it destroys the cotton.

Professor BARNARD. That is one advantage of our methods, as with them there can be given the proper motion, while in other methods of pumping it becomes necessary to have a strainer at the bottom of the pump, which can be made easily, so that the pumping will generally keep the water stirred up. Of course it is simple, if you have a larger tank, to build shelves in that tank so there is a motion from one to another; that will keep the poison suspended more effectually.

Mr. WARNER. In Texas we use a poison that does not need stirring up. It is held in solution, and in my experience in poisoning 500 acres we did not stir it up at all.

Question. What poisons in use are preferable, both in cheapness and availability?

Professor RILEY. I shall have to answer, according to my own views, that London purple is, all things considered, the cheapest and safest for many reasons. There are various forms of arsenic which you can use, which probably would be as cheap or cheaper than London purple, but they are more injurious to the plant. The trouble with most of the pure arsenical remedies is that they burn the plant. Paris green, all things considered, is the best remedy. I would prefer it to London purple, but that it is a great deal dearer. Both London purple and Paris green are sometimes badly adulterated. There is a remedy which promises to be a great remedy in the future, if we can secure enough of it; that is pyrethrum.

A MEMBER. What is its popular name?

Professor RILEY. There is no popular name. It is the plant that I have been endeavoring to have grown in this country. When once the planter can grow a patch of pyrethrum alongside his cotton, and make his own poison, he will be apt to do it.

A MEMBER. Is it made in decoction?

Answer. It can be used as powder or decoction, or in solution like the other poisons. It kills by contact and does not, therefore, endure so long as arsenical poisons. It is perfectly harmless to man and beast.

Mr. HENDERSON. Suppose your field was already overrun, as this one here on the grounds was, would one application of these poisons be sufficient?

Answer. Yes, sir; one application will kill all the worms.

Question. Should that application be heavier than if you were going to anticipate them?

Answer. Yes, sir.

Question. Is there any danger attached to turning stock into a field that has been poisoned?

Answer. Yes, there would be if you used either of the arsenical poisons which I mentioned, but not with the pyrethrum. But you don't generally turn stock into a cotton field.

Professor BARNARD. In Arkansas last year I know of several mules and horses that were standing all night in a poisoned field, and in which

they browsed. The poison which was used was London purple. I think, if it is put on in proper quantity, not excessively, but simply sufficient to kill the insect, it will not be sufficient to kill or injure domestic animals. In case it does, the remedy is very simple. Sesqui-oxide of iron is a perfect antidote, and as effectual upon animals as it is upon man. I found one very intelligent planter there was making his own antidote. He kept two or three oyster cans full of nails and water. The rust of the nails is oxide of iron, and that was taken up by the water, which gave it a yellowish color, and that he kept as an antidote for these poisons. Surely any one can prepare that.

Question. How did he apply it?

Professor BARNARD. Let the animal drink it; if the animal will not drink it, give it to him with the syringe.

Mr. WARNER. I had a little experience in the 500-acre field. The animals came together to fill up the sacks; there were some melons in the field; the negroes were eating them, and a piece fell in the barrel of poisoned water. One of the negroes picked it up and said "that was the best piece." They said, "That will kill you." "All right," said he, "let me die this way." It did not hurt him at all.

A MEMBER. Was this poison the patented mixture, the Lodi poison?

Professor RILEY. The arsenical poison referred to by Mr. Warner is, or was, sold under a patent, in pound packages, for $1 each. It is essentially the same as that prepared by the Lodi Chemical Works, of New Jersey; 50 grains of arseniate of soda and 200 grains of dextrine are dissolved in one gallon of cold water, and 4 ounces of the mixture are used to 40 gallons of water. It has the same disadvantage of all pure arsenical mixtures, of causing the squares to flare. Notwithstanding the slight danger, as illustrated by what others here have said, yet there is some little danger connected with the use of these arsenical poisons, and this should not be overlooked. I have seen very many negroes badly poisoned in the groins from sitting on horses where the poisoned spray would thoroughly wetting them in time. Now that has been one of the obstacles which I have endeavored to overcome in our method of poisoning from the ground up.

Mr. WARNER. In my great anxiety to ascertain about this poison before I used it, when I went to Washington I went to the Patent Office and found that the poison was patented in the name of Robira and another gentleman of Galveston whose name I have forgotten. They have abandoned it. I believe, as Professor Riley does, that it is to some extent injurious. It is, as he remarked, arseniate soda and dextrine.

Professor BARNARD. If these poisons get on sores or broken skin they will take effect very quick, but if the skin is sound they do not become absorbed. Sometimes the chafing will irritate the skin, but with healthy skin there is no danger at all.

On motion, the convention adjourned *sine die*.